



**Ethylene**  
Middle East  
Technology  
Conference

# From Zero to One with Zero.One

Bruno Bülow  
Product & Sales Manager  
ARVOS GmbH SCHMIDTSCHESCHACK

# Agenda

Introduction

Current Situation

Introduction to Zero.One

Predictive Maintenance in Theory and Practice

Machine Learning

Contact

An aerial view of an industrial facility, likely an oil or gas platform. The scene shows a complex network of blue metal structures, pipes, and walkways. Several workers in blue uniforms and white hard hats are visible, engaged in various tasks. A large white cylindrical tank is a prominent feature in the center. The overall atmosphere is one of active industrial work.

## DECISION

*"I have repaired this item many times. Maybe it is better to buy a new one."*

## MATERIAL

*"Hi Joe, where is the needed material?  
The plant has been down for 5 days and I can't start with the repairing service."*

## PEOPLE

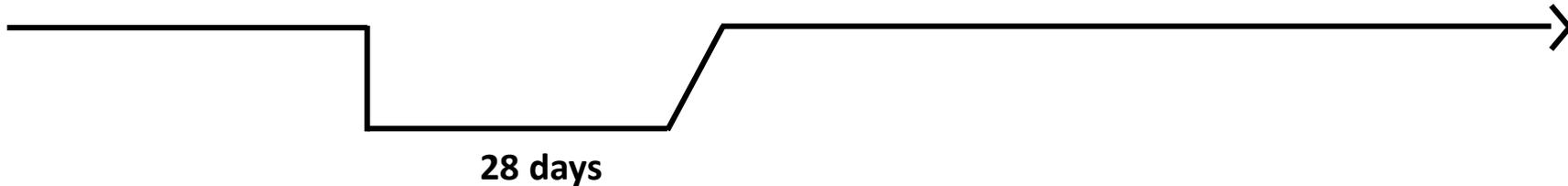
*"There were so many difficulties upfront to get our onsite service organized. Why can this not be faster?"*

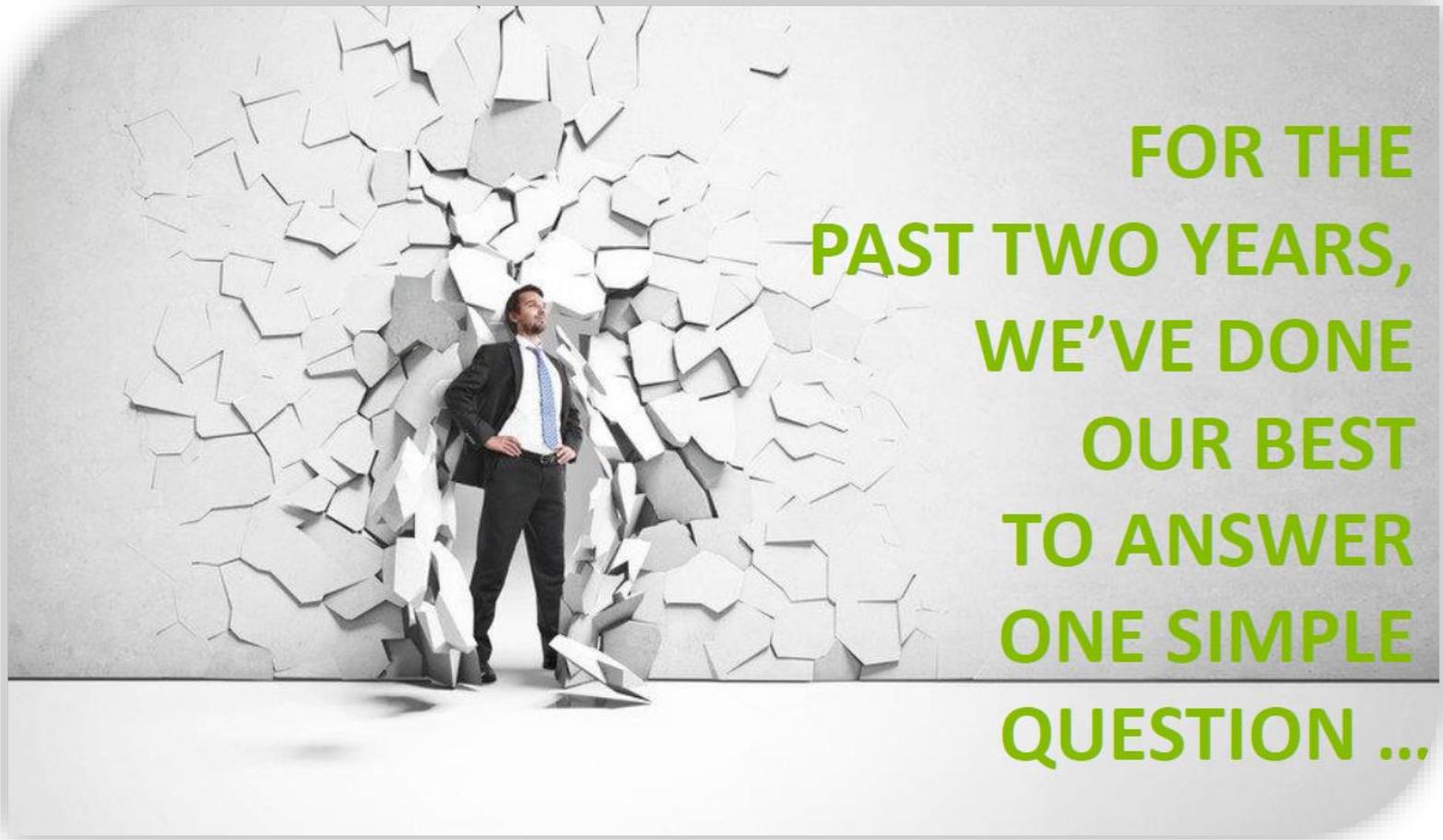
## PROFIT

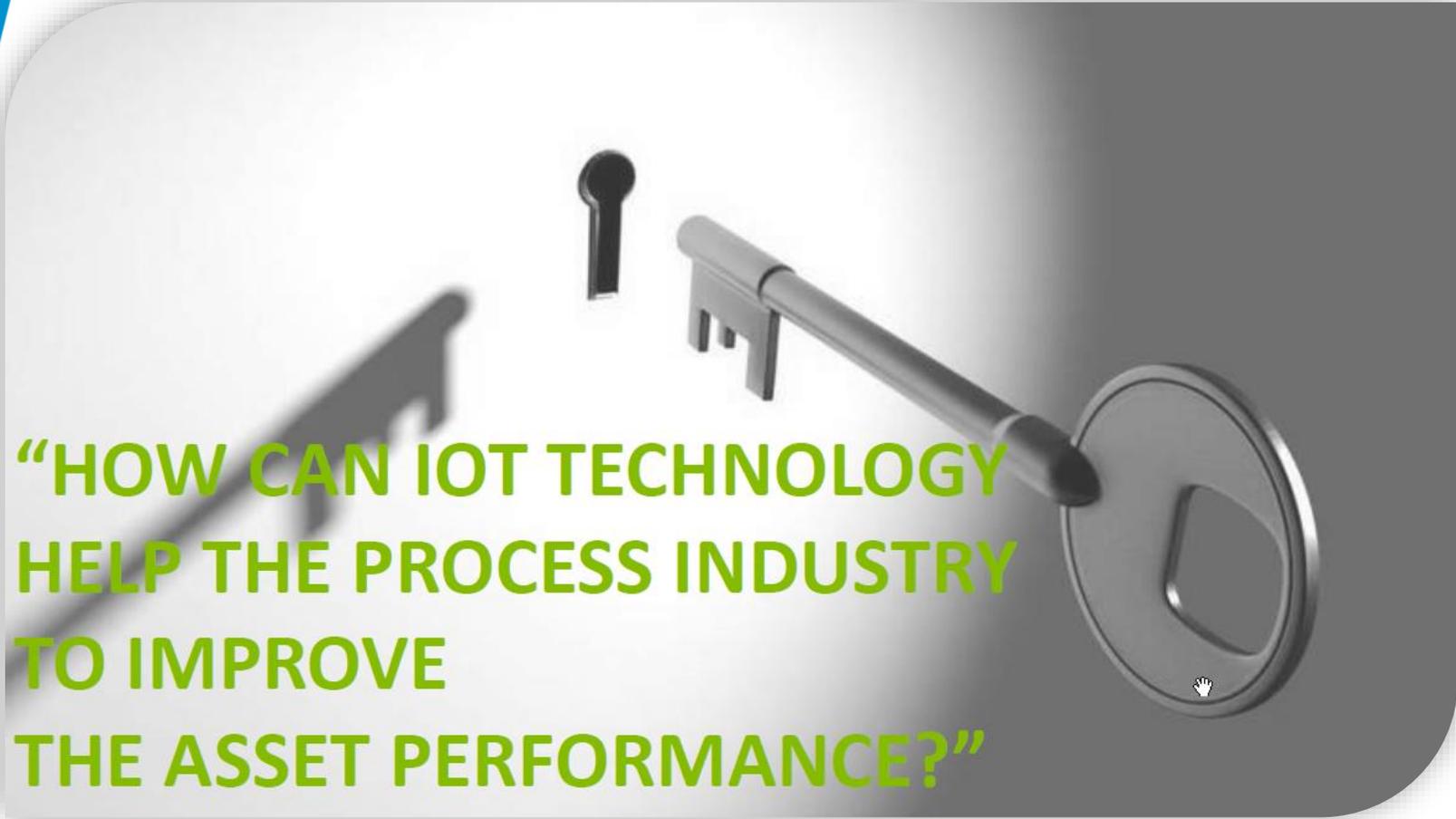
*"Hey boss, this downtime takes at least 14 days and will sum up to more than 4 million dollars."*

# Maintenance Schedule

Scheduled maintenance with longer downtime through inspection and material order







**“HOW CAN IOT TECHNOLOGY  
HELP THE PROCESS INDUSTRY  
TO IMPROVE  
THE ASSET PERFORMANCE?”**

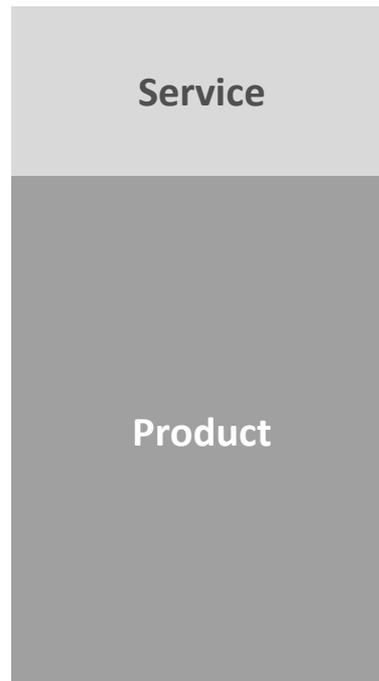
# Customer Benefits

Customer benefits based on function, availability and results

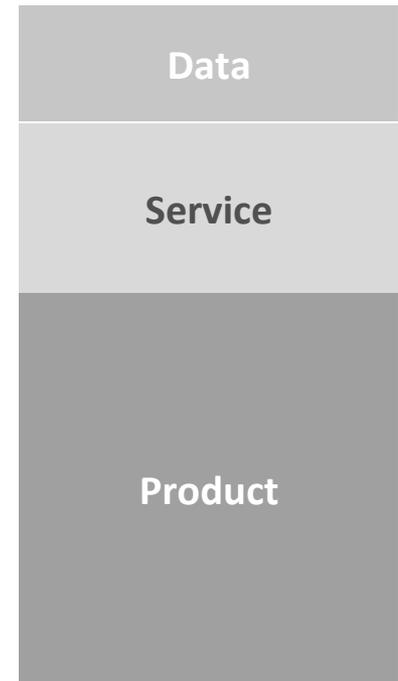
1 Today



2 Tomorrow



3 Near future



# McKinsey Digital Compass - Value Drivers and Digital Levers



Remote Monitoring  
Predictive Maintenance  
Augmented Reality



- Early indication of problems
- Timely corrections
- Prioritization of resources
- 30 – 50% reduction of total plant downtime



## THE DIGITAL SERVICE PLATFORM

**SCHMIDTSCHKE SCHACK connects existing plant equipment with the Internet of Things (IoT)**

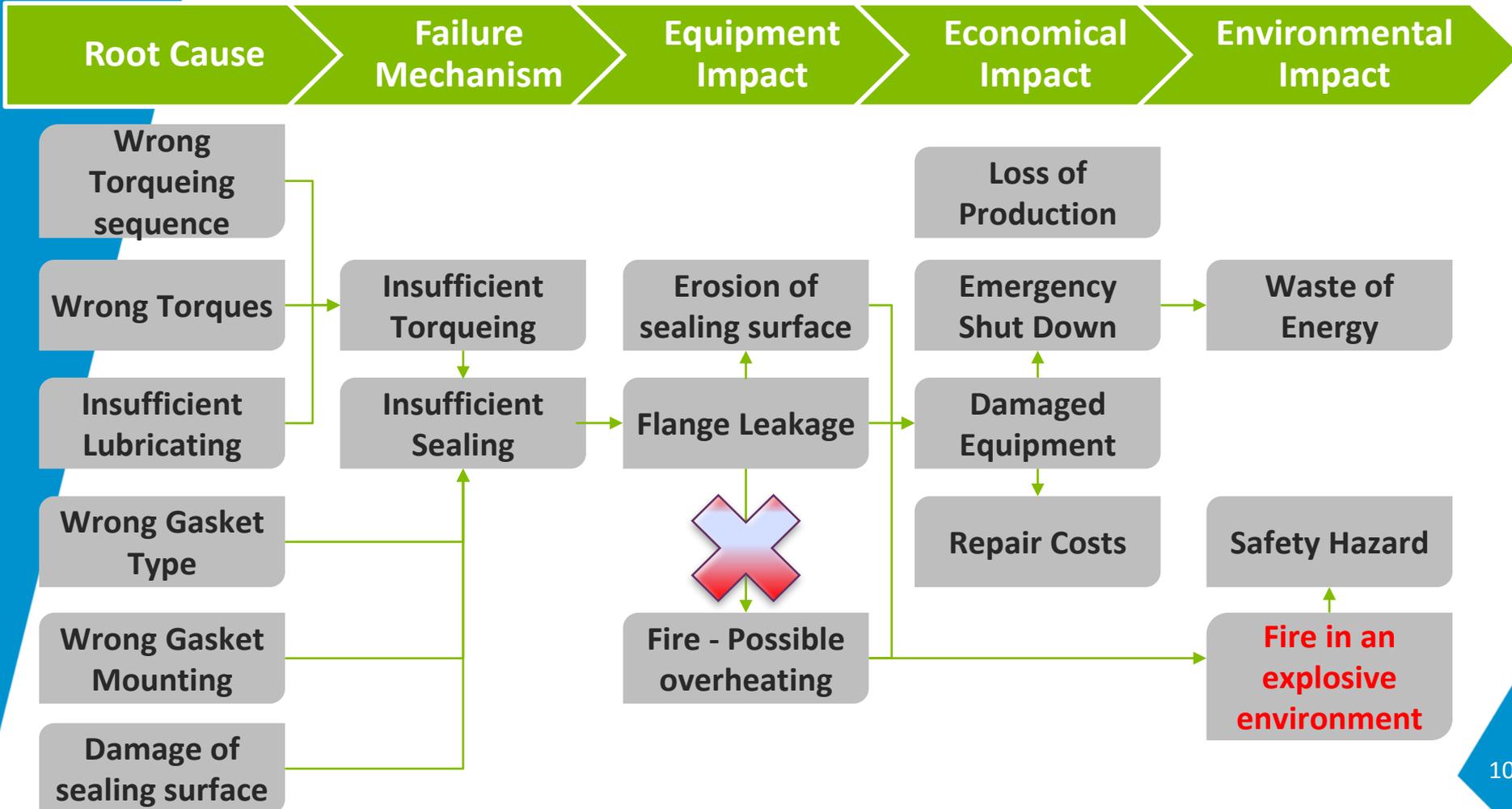
Sensor-based analysis of the components of an industrial plant

Minimized Downtime

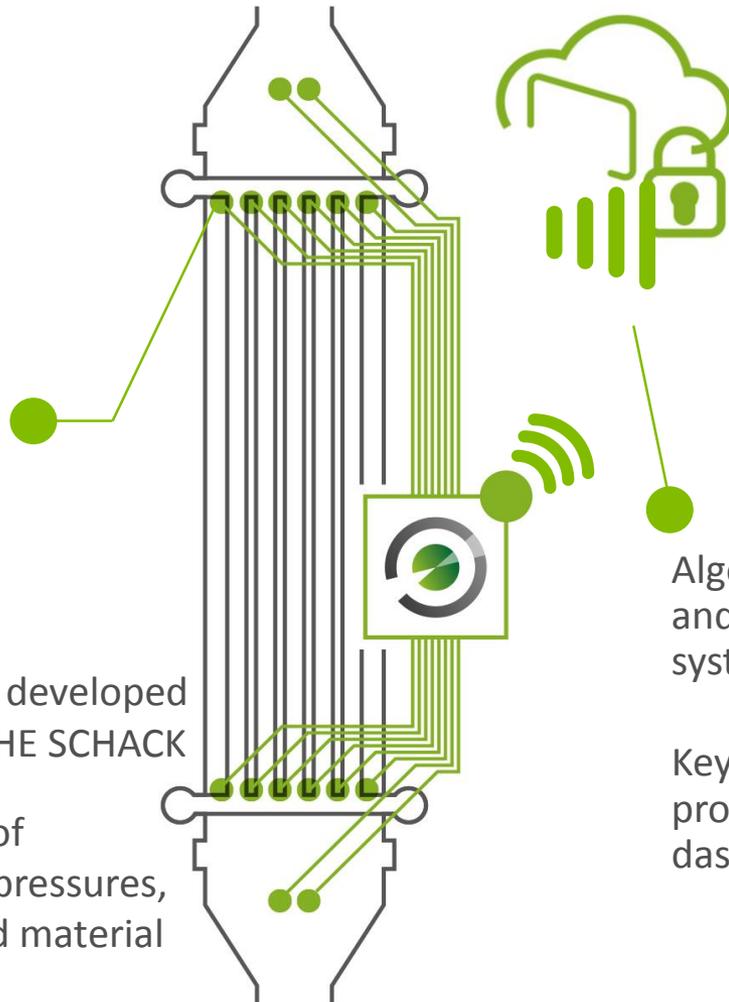
- Monitored threshold values
- Recommendations for optimal TLE utilization
- Easy-to-schedule service work



# Anatomy of Heat Exchanger Failure – Flange Leakage



# How Does Zero.One Work?



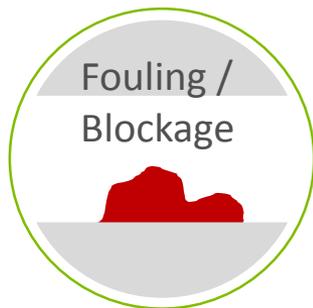
Special sensors developed  
by SCHMIDTSCHESCHACK

Measurement of  
temperatures, pressures,  
mass flows, and material  
thickness



Algorithm-based analysis of the current status  
and performance data compared with historical  
system data and product design information

Key-information on performance, risks and  
prognoses visualized in customer-individual  
dashboards



zerOne



Tube Fouling

Blockage in 14 days

Propose tube  
cleansing  
or

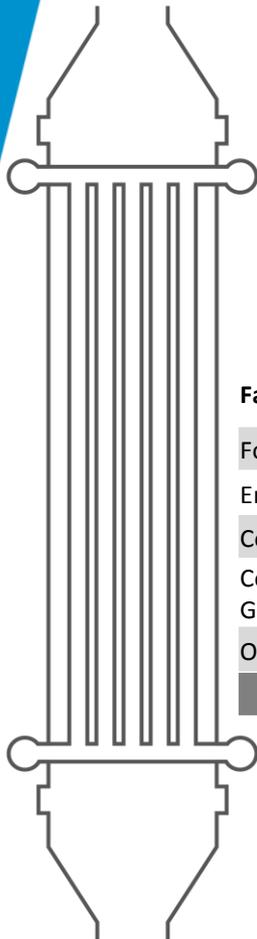
Tube change

or

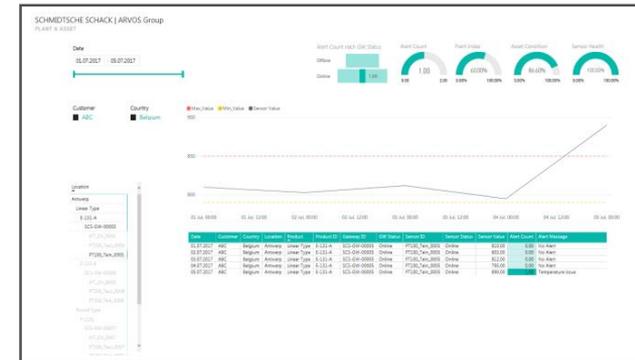
Equipment change

# SCS Prediction example

## Enabling smart Heat Exchangers



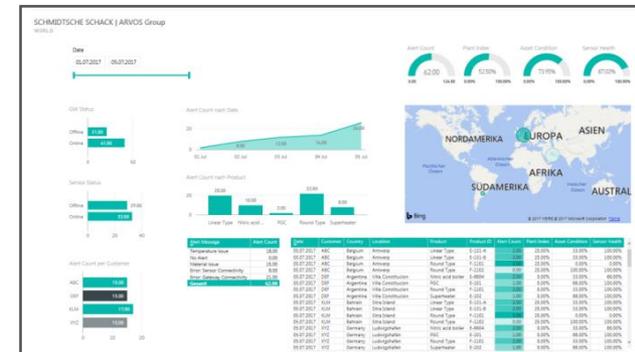
Site condition



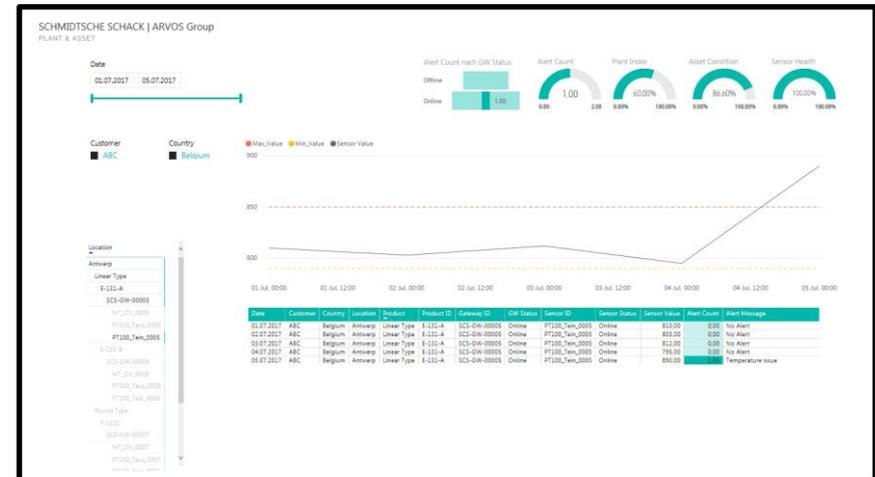
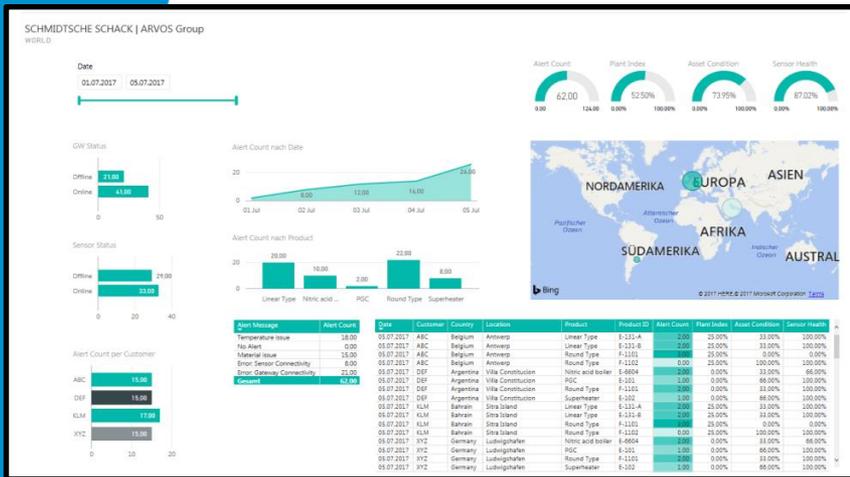
Asset condition

Failure Nature	Jan. 17	Apr. 17	Jul. 17	Okt. 17	Jan. 18	Apr. 18	Jul. 18	Okt. 18
Fouling/ Blockage	Green	Green	Yellow	Yellow	Red	Red	Red	Red
Errosion/ Corrosion	Green	Green	Green	Yellow	Yellow	Yellow	Red	Red
Connectivity Sensor	Green							
Connectivity Gateway	Green							
Others	Green							
Total Risk	Green	Green	Yellow	Yellow	Red	Red	Red	Red

Fleet condition



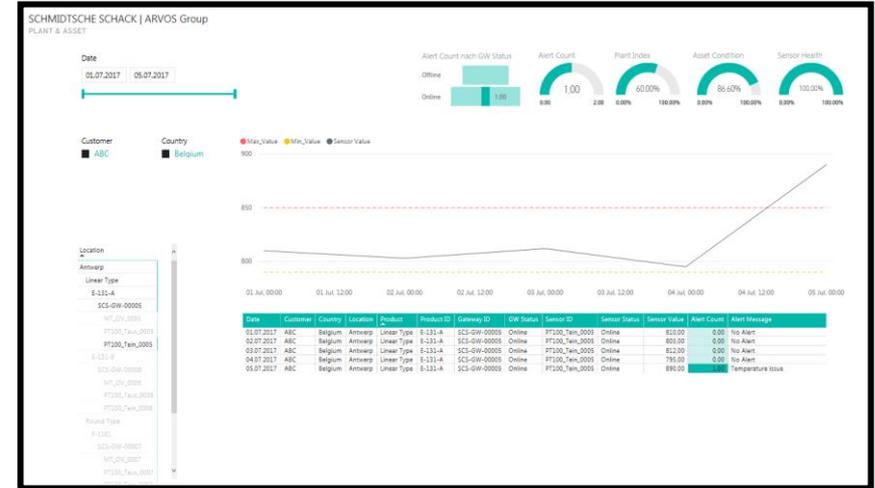
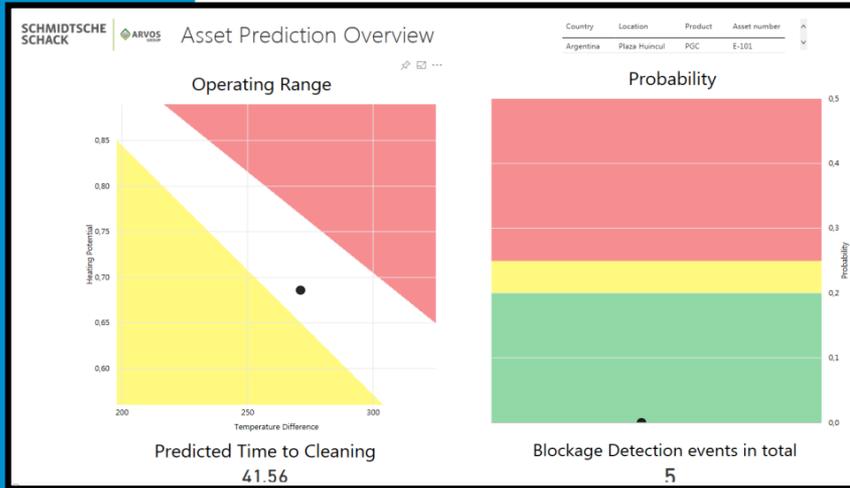
# Dashboard Examples



World-wide status of **plant index**, **asset condition** and **sensor health**  
**Alerts** presented by different categories  
 Per day, customer, product type **Sensor** and **gateway status**  
 Sensor **values above/ below thresholds**

Drill down to a specific **customer**, **country**, **location**, **asset**, **gateway** and **sensor**  
 Alert count, plant index, asset condition and sensor health  
**Time series analysis** per sensor incl. thresholds

# Dashboard Examples



## Asset Prediction Overview

Based on **historical data** and **ML algorithms**

Predicted time to cleaning

Probability of tube blockages within the TLE

Predictions on actual values vs. specified values to be developed

(e.g.: (actual – specified value) > +/- 10% = warning alert)

## Customer specific

Dashboard design and elements can be adapted per customer

Underlying ML algorithms to be developed per needed prediction

Presentation of live and historical data

MS Azure architecture to be designed per customer

# High Level Architecture

Customer site



Cloud

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ARVOS GROUP

Dashboards: life -, historical data, predictions      New business models



Data Integration

**Microsoft**

- Machine Learning
- Storage
- Live data
- Historical data
- Sensor/ gateway administration
- Security components
- Add. components if required

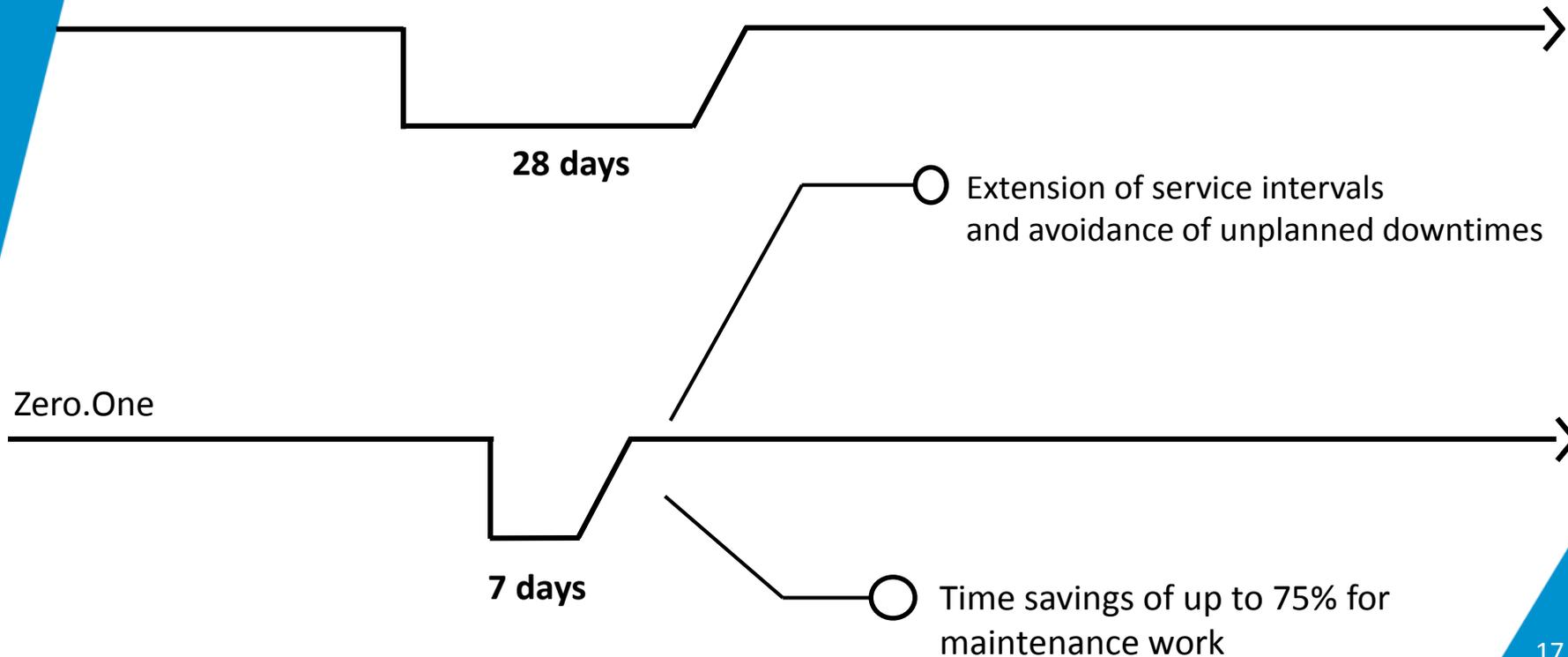
- Transfer Line Exchangers
- Syngas Coolers
- Carbon Black Air Preheater
- Process Gas Cooler
- Nitric Acid Boiler



- Predictive Maintenance
- Service business development
- Smart data and dashboards for customers, service partners, etc.
- Consulting for IoT and data analytics

# Maintenance Schedule with Zero.One

Scheduled maintenance with longer downtime through inspection and material order



Life-cycle monitoring to detect material deterioration and wear at an early stage

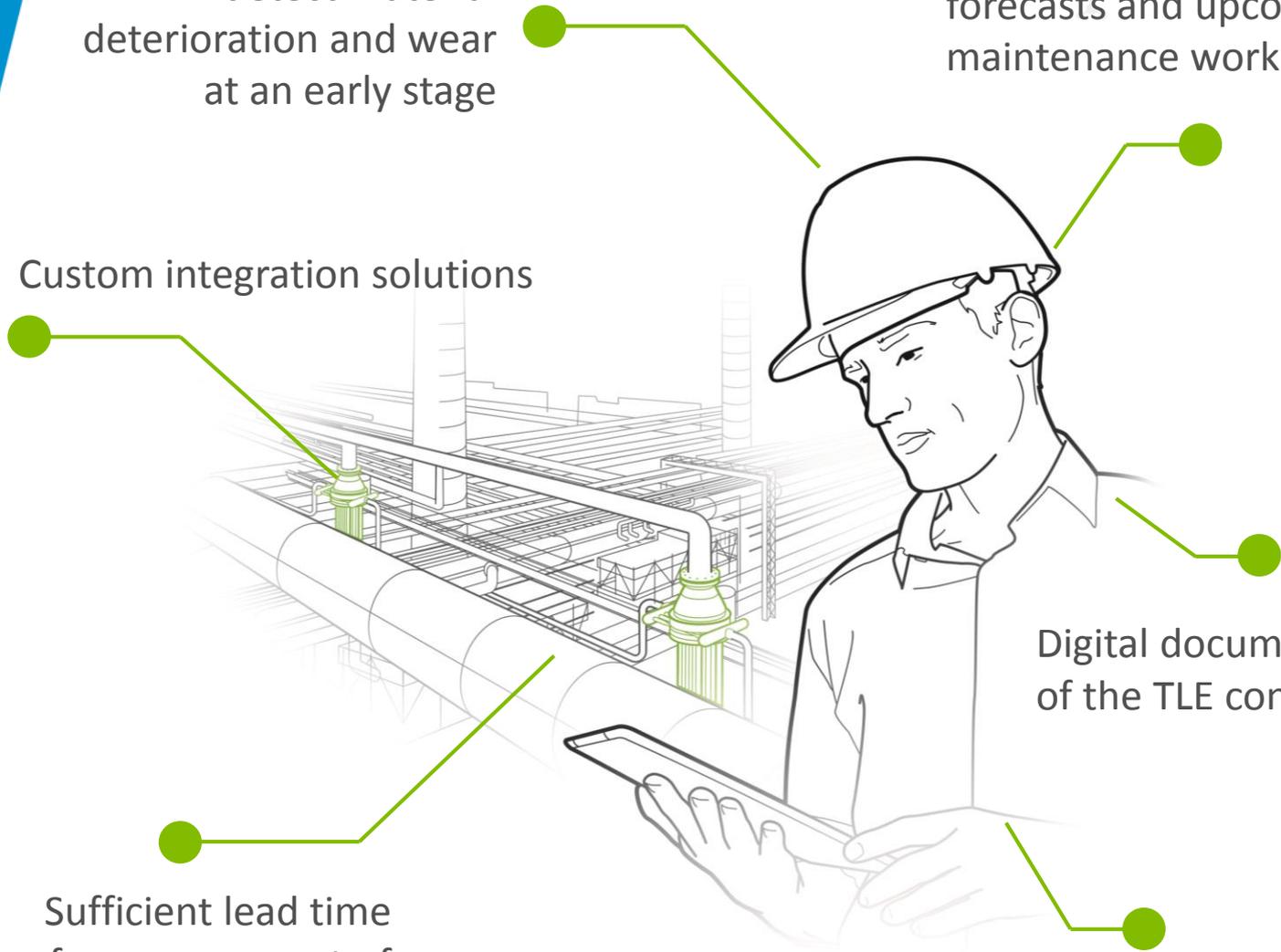
Preparation of availability forecasts and upcoming maintenance work

Custom integration solutions

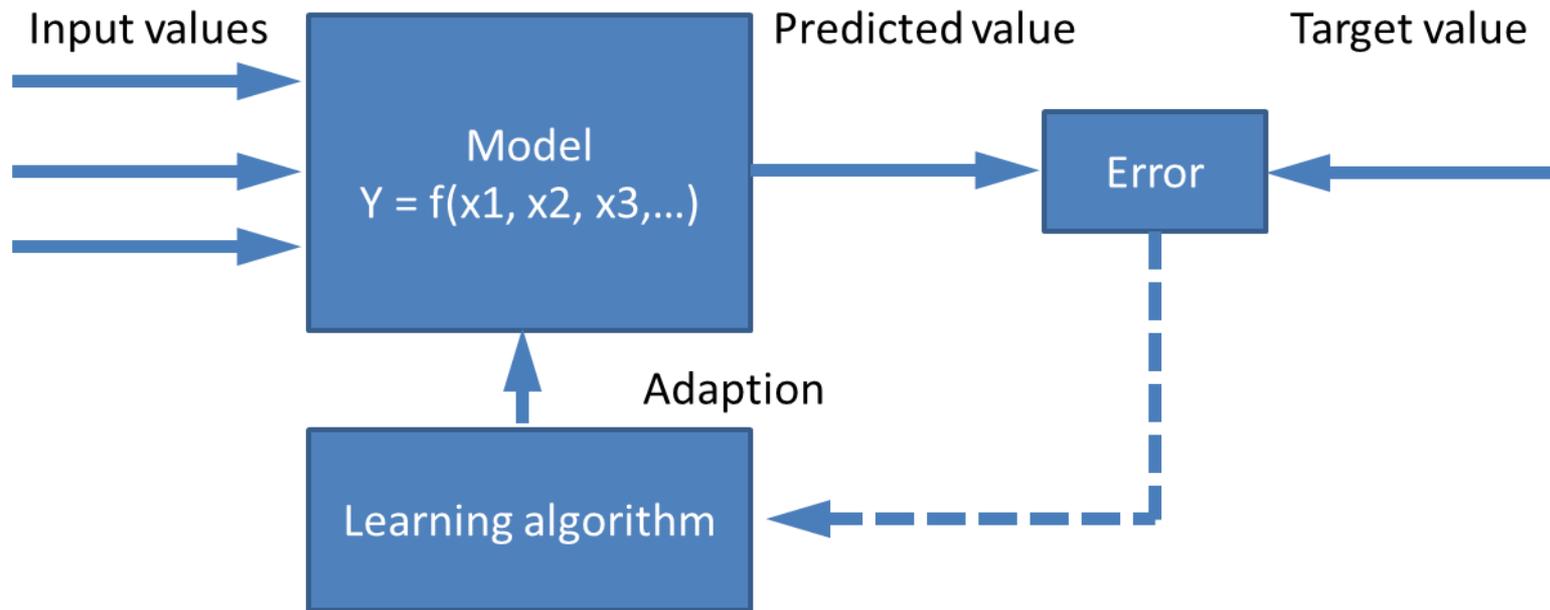
Digital documentation of the TLE condition

Sufficient lead time for procurement of replacement parts

Provision of comprehensible rationale for maintenance decisions

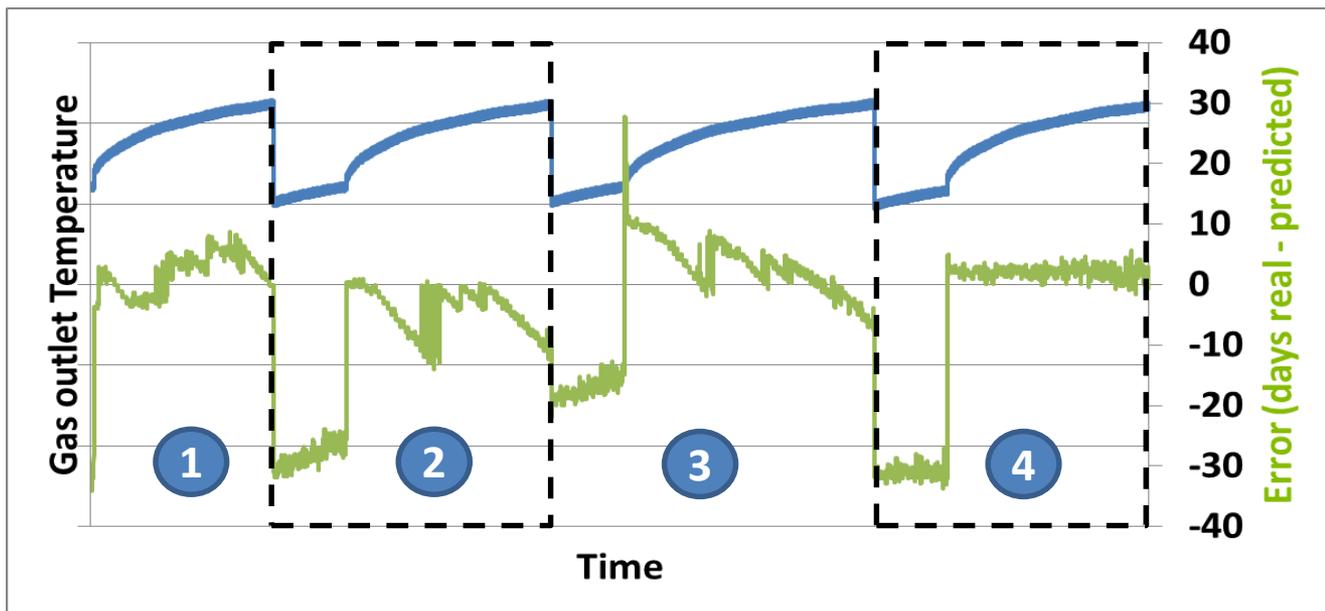


# Principle of machine learning



1. Training phase to adjust the model
2. Verification phase to evaluate model reaction to new input data

# Predict time until de-coke – Test the model



#	1	2	3	4
Heating Surface	85%	85%	100%	100%
Load	100%	90%	90%	100%
Operation time	reduced	regular	extended	regular

# Zero.One brings value to the whole team

- Predictable events
- Longer planning horizons with greater transparency
- Knowledge of what is going to happen
- Planning of service teams only on requirement
- Qualification of employees on digitalization





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SCHACK



## Bruno Bülow

Product & Sales Manager



+49 (0)561 / 95 27 247

[Bruno.Buelow@Arvos-Group.com](mailto:Bruno.Buelow@Arvos-Group.com)



ARVOS GmbH | SCHMIDTSCH  
SCHACK  
Ellenbacher Straße 10 | 34123 Kassel | Germany

[www.Schmidtsche-Schack.com](http://www.Schmidtsche-Schack.com)

## Julia Möller

Head of Zero.One Distribution

+49 (0)561 / 95 27 123

[Julia.Moeller@Arvos-Group.com](mailto:Julia.Moeller@Arvos-Group.com)